

Case Study: **Omni-Lite Industries**

Omni-Lite Optimizes Manufacturing Process of Automotive Rivet using Simulation Software

Overview

Omni-Lite is a rapidly growing advanced materials company that develops and manufactures precision components utilized by several Fortune 500 companies including Boeing, Airbus, Alcoa, Ford, Caterpillar, Borg Warner, Chrysler, and the US Military, Nike, and Adidas. To aid in its aggressive product development process, the engineering team began using the sophisticated finite element forging simulation software package Simufact.forming, from MSC Software.



“Using Simufact.forming has enabled us to shorten our process development time considerably, respond faster to customer requirements, and design new products faster”

Mike Walker, VP Research and Development, Omni-Lite Industries

Challenge

One part that is produced by Omni-Lite is an automotive rivet. It is cold formed out of 1008 material. The manufacturing process uses a five-die progression, and it is produced on a Nakashimada TH5-6A.

The initial tooling design was done prior to the introduction of Simufact.forming. During the second station, engineers attempted to form two features at once. The round wire was

formed into a square head, and at the same time, a counter bore was introduced. This progression design is shown in Figure 1. The initial wire cut-off has a 0.308” diameter and length of 0.354”.

During the physical tryout of this design, a fold was formed during the second station. This fold was detected during investigation of a macro, and shown in Figure 2. The fold

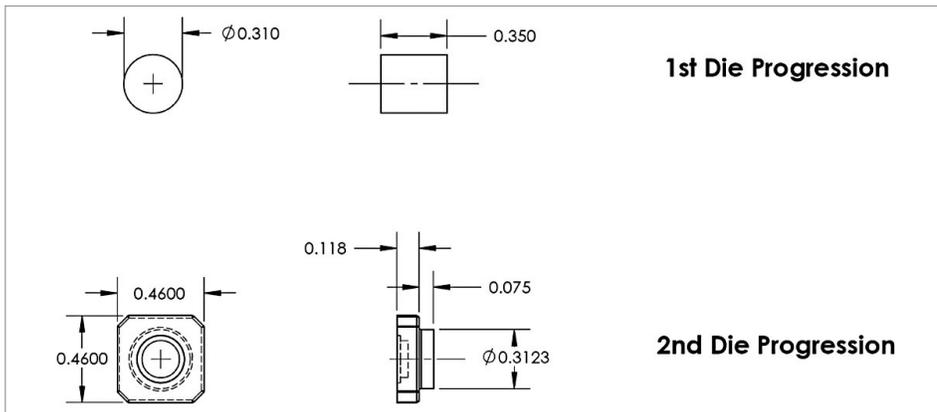


Figure 1: Initial progression, designed without simulation.

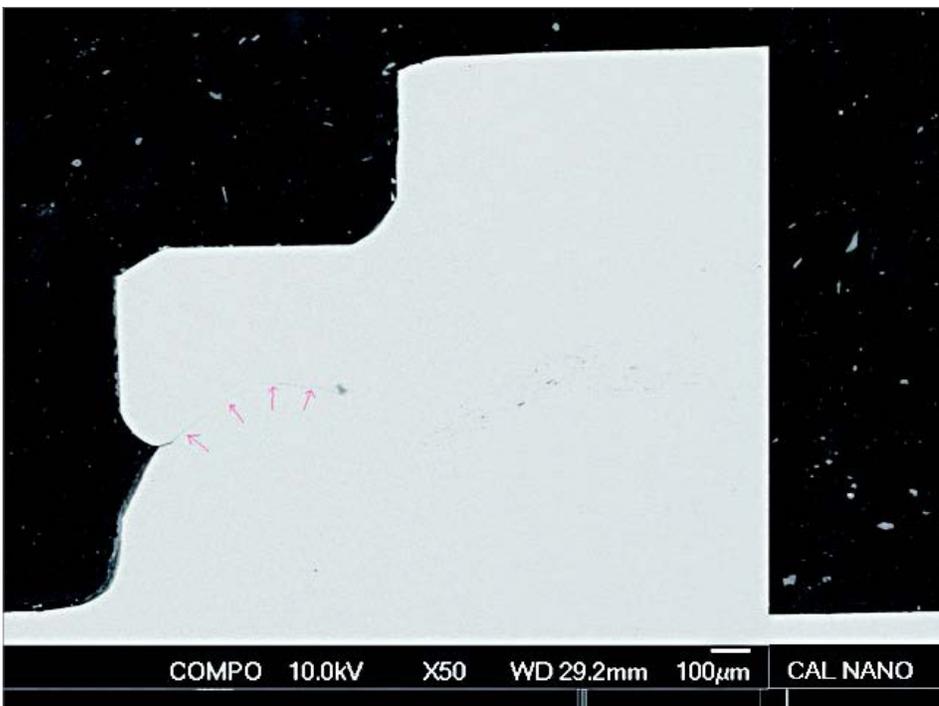


Figure 2: Macro of part after physical tryout, showing a fold.

Key Highlights:

Product: Simufact

Industry: Machinery

Benefits:

- Optimize manufacturing process to reduce development time
- Ability to respond more quickly to changing customer requirements
- Accelerated innovation due to faster design process

was very deep, and the part would not be accepted by quality control.

At the same time of this physical testing, Omni-Lite received on-site training for Simufact.forming. One of the exercises was to simulate the material flow of this flawed progression design.

Solution

Inputs for the simulation were readily available, and since the tooling was already drawn up in the CAD system, the material data was available in the material database of the software and the machine parameters that correspond to the internal crank-mechanism were provided by the machine maker. The software automatically calculates the punch velocity profile from these machine parameters.

The simulation correctly showed how the fold was created, giving Omni-Lite confidence that the shop-floor process was correctly captured by simulation inputs (see Figure 3).

After review of the material flow animations, it became clear what the problem was. During the second station, the material was flowing outwards, creating a large gap at the inside wall. Once the outer die wall was reached, the fold was created during the subsequent back-flow to fill in the gap.

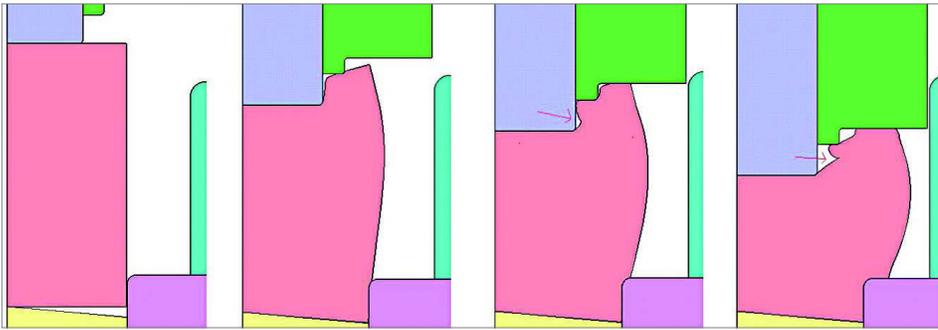


Figure 3: Simulated material flow of initial design, explaining the creation of the fold.

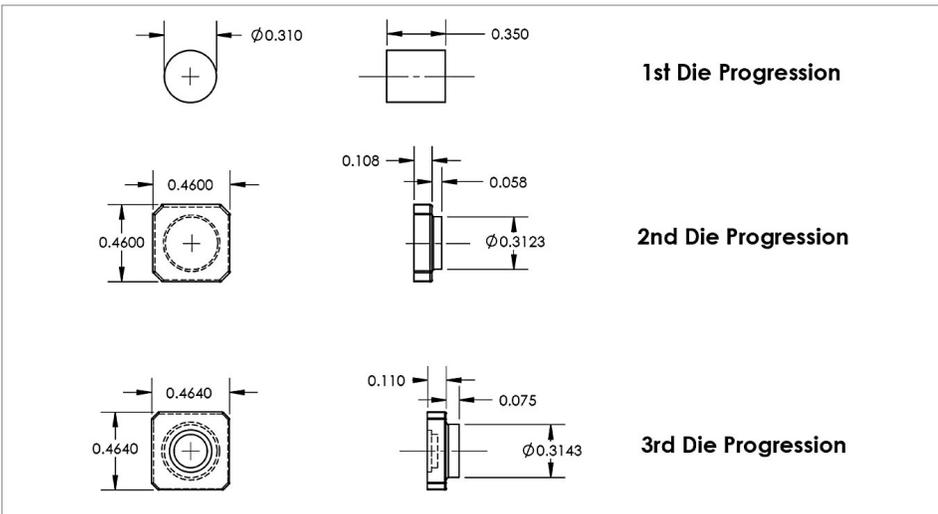


Figure 4: Optimized progression, designed with simulation.

After some trial designs on the computer, it was decided that the problem was best fixed by using an additional station to form the features. The newly designed progression is shown in Figure 4.

It can be seen that during the second station, the square head is formed, without the counter-bore. Then, during a third station, the counter-bore is introduced. The simulations with Simufact.forming showed no defects in the material flow (see Figure 5).

The tooling was then made, and the physical tryout performed. During the physical tryout, a correct part was formed, and no folds were detected, as shown in the macro in Figure 6.

Results/Benefits

It was found that Simufact.forming provides

invaluable information at a critical time in the design process. The software provides the opportunity to see how design variations will work out prior to purchasing any tooling. It allows Omni-Lite to shorten its process development time considerably, and respond faster to customer requirements and design new products faster.

About Omni-Lite Industries

Founded in September 1992, Omni-Lite has quickly grown to become one of the world's leading developers of precision components utilizing advanced composite materials and computer-controlled cold forging techniques. Omni-Lite's early success came from the sports and recreation industry, where its ultra lightweight ceramic composite track

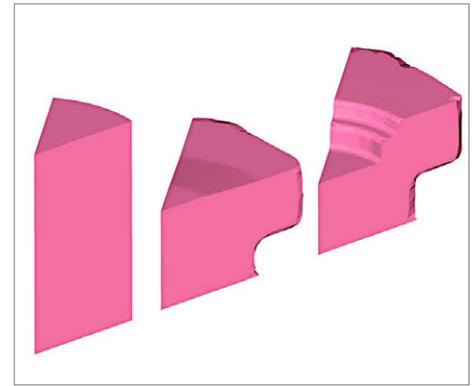


Figure 5: Simulated material flow of optimized design, showing no defects (45% symmetry was used in the simulation).

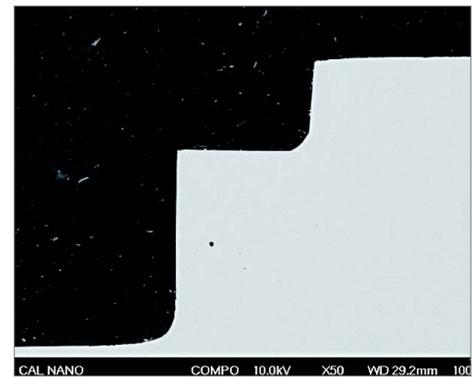


Figure 6: Macro of optimized part after physical tryout, showing no defects.

spikes quickly became the industry standard used by most of the world's elite athletes. The company has since broadened its product offerings to include products for the automotive, commercial, aerospace, and military markets. Omni-Lite develops and manufactures precision components utilized by several Fortune 500 Companies including Boeing, Airbus, Alcoa, Ford, Caterpillar, Borg Warner, Chrysler, the U.S. Military, Nike and Adidas.

For more information on Simufact and for additional Case Studies, please visit www.mscsoftware.com/product/simufact

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